

## Formal Inspection: A Tool for TQM

Linda L. Welz  
John C. Kelly  
Jet Propulsion Laboratory  
4800 Oak Grove Drive, Mail Stop 125-233  
Pasadena, California 91109  
Phone (81 8)354-6681  
FAX (81 8)393-1 362  
lwelz@spa1.jpl.nasa.gov

The goal of the Formal Inspection Program at the Jet Propulsion Laboratory (JPL) is to support projects wishing to use Formal Inspections to improve the quality of software and system level engineering products. An established training and follow-up program has been in place for over five years. Formal Inspections (JPL tailored Fagan Inspections) provide a method for technical reviews whose objective is to increase quality and reduce the cost of software development by detecting and correcting errors early. A primary feature of inspections is the removal of engineering errors before they amplify into larger and more costly problems down stream in the development process. Also, inspection metrics provide a basis for a continuous improvement program for the software development process. Formal Inspections are supporting and in agreement with the "total quality" approach being adopted by many NASA centers.

Over 500 inspections have been conducted on JPL projects since their introduction. Substantial gains in the quality of early lifecycle products have resulted from inspections. Formal Inspections applied to requirements have uncovered an average of one major error in every three pages. The most common of these errors have been *missing* requirements, which accounted for 67% of the major errors found. Completeness of requirements documents is one of the most significant of many measurable improvements resulting from Formal Inspections. Additional results showed that finding and fixing errors through inspections was significantly less costly than similar rework performed during the test phases. Inspections require an average of 0.7 work hours to fix a defect, compared to a range of 5 to 18 hours to fix a defect during formal testing.

The Formal Inspections Program was carried out by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.